

### **3. LICENSING AND REGULATION**

There are a number of areas where national and international laws and regulations can influence your ability to set up wireless networks.

Since these rules vary from country to country it is impossible to give an overview of which regulations may apply in your region.

It is also worth noting that there may be a huge difference in which laws exist, and how they are regulated in practice. In other words there may be countries where using the 2.4 GHz / 5 GHz spectrum for outdoor wireless is technically illegal, but where everyone does it anyway.

As a rule of thumb, if other people are building similar networks to what you intend, contact them and find out what legal issues they may have run into. If such networks are very widely deployed in your country, then you probably don't need to worry too much. On the other hand, it is always advisable to seek local advice, from hardware vendors, wireless experts or others who have come before you, before committing time and resources to building a wireless network. Whatever you do, it is important you take local laws and regulations into consideration.

#### **Examples of relevant types of regulation**

Each country may have different rules, and each scenario may come across different types of regulations. The areas where regulations may be relevant include licenses for using specific radio frequencies, rules regarding the right to install towers for antennas, the maximum power allowed and telecom licensing rules limiting your ability to provide Internet access to others.

The types of legal issues that may (or may not) be worth considering when planning a wireless network include:

- Spectrum Licensing
- ISP/Telecommunications Licenses
- Tower permits for antennas
- Transmission power and antenna gain limits
- Certification of equipment
- ISP Terms of Use

#### **Spectrum Licensing**

Most countries consider RF spectrum as an exclusive property of the state. The RF spectrum is a national resource, much like water, land, gas and minerals. Unlike these, however, RF is reusable. The purpose of spectrum management is to mitigate radio spectrum pollution and maximize the benefit of usable radio spectrum.

The first sentence of the International Telecommunications Union (ITU) constitution fully recognises “the sovereign right of each State to regulate its telecommunication”. Effective spectrum management requires regulation at national, regional and global levels.

Licensing is an orderly way to manage who, when, where and how spectrum resource is used. The unlicensed wireless spectrum was set around the 2.4 GHz band.

In June 2003, the ITU made available the 5 GHz band for license-exempt technology deployment. The 900 MHz band, unlicensed in the United States, is presently used in Western Europe and in many developing countries for GSM phones. Each country has the sovereign right to regulate its telecommunication and to interpret the international Radio Regulations. Governments define the rules and conditions of the frequency use.

*(From: Wikipedia "Spectrum Management")*

The technologies described in this book (mostly) use a license-exempt slice of the spectrum referred to as the ISM (Industrial, Scientific and Medical radio bands). Radio frequencies in the ISM bands have been used for communication purposes, although such devices may experience interference from non-communication sources.

The ISM bands are defined by the ITU-R (ITU's Radiocommunication Sector) at 2.4 and 5 GHz. Individual countries' use of the bands designated in these sections may differ due to variations in national radio regulations. Because communication devices using the ISM bands must tolerate any interference from ISM equipment, unlicensed operations are typically permitted to use these bands, since unlicensed operation typically needs to be tolerant of interference from other devices anyway.

In the US, the FCC (Federal Communications Commission) first made unlicensed spread spectrum available in the ISM bands in rules adopted on May 9, 1985. Many other countries later adopted these FCC regulations, enabling use of this technology in many countries.

*(From: Wikipedia "ISM Band")*

### **ISP/Telecommunications Licenses**

In some countries an ISP license would be required before deploying any

network infrastructure for sharing networks over public spaces. In other countries this would only be required to run commercial networks.

### **Tower permits for antennas**

When deploying long-range outdoor networks, it is often necessary to build a tower for the antenna. Many countries have regulations regarding the building of such antenna-towers if they are more than 5 or 10 metres above the roof or ground.

### **Transmission Power limits**

When setting transmission power limits, regulatory agencies generally use the Equivalent Isotropically Radiated Power (EIRP), as this is the power actually radiated by the antenna element. Power limits can be imposed on output power of devices as well.

As an example, the FCC enforces certain rules regarding the power radiated by the antenna element, depending on whether the implementation is point-to-multipoint (PtMP) or point-to-point (PtP). It also enforces certain rules regarding the maximum power transmitted by the radio.

When an omnidirectional antenna is used, the FCC automatically considers the link a PtMP link. In the setup of a 2.4 GHz PtMP link, the FCC limits the EIRP to 4 Watts and the power limit set for the intentional radiator is 1 Watt.

Things are more complicated in the 5 Ghz band. The Unlicensed National Information Infrastructure (U-NII) radio band is part of the radio frequency spectrum used by IEEE-802.11a devices and by many wireless ISPs. It operates over three ranges:

U-NII Low (U-NII-1): 5.15-5.25 GHz. Regulations require use of an integrated antenna. Power limited to 50 mW.

U-NII Mid (U-NII-2): 5.25-5.35 GHz. Regulations allow for a user-installable antenna, subject to Dynamic Frequency Selection (DFS, or radar avoidance). Power limited to 250 mW.

U-NII Worldwide: 5.47-5.725 GHz. Both outdoor and indoor use, subject to Dynamic Frequency Selection (DFS, or radar avoidance). Power limited to 250 mW.

This spectrum was added by the FCC in 2003 to "align the frequency bands used by U-NII devices in the United States with bands in other parts of the world".

The FCC currently has an interim limitation on operations on channels which overlap the 5600 - 5650 MHz band.

U-NII Upper (U-NII-3): 5.725 to 5.825 GHz.

Sometimes referred to as U-NII / ISM due to overlap with the ISM band.

Regulations allow for a user-installable antenna. Power limited to 1W.

Wireless ISPs generally use 5.725-5.825 GHz.

(From: Wikipedia "U-NII")

For PtP in the 5 GHz band the maximum EIRP allowed is considerably higher, since a high gain antenna produces a very narrow beam and therefore the interference caused to other users is considerably less than in PtMPt topology.

### **Certification of equipment**

Governments may require a formal certification that a given radio equipment comply with specific technical standards and local regulations.

This is often referred to as *homologation*, and the process must be done by an independent laboratory authorised by the government of the country.

Certified equipment is allowed to operate without an individual license. It is worth noting that certification may only apply to the original factory state for radio equipment.

For example, changing the antenna on a wireless access point in the United States invalidates the FCC Certification.

### **ISP Terms of Use**

Many ISP's include in their "Terms of Use" a clause that prohibits users from sharing an internet connection with other users.

There may also be commercial grade connections that do not have these limitations.

It is important to note that this is NOT a legal issue, but a clause of the contract with the ISP, and the repercussions for breaching these is usually a disconnection of the Internet connection.